AD-751 768

## SHOCK TUBE TEST OF A 36-INCH BLAST VALVE

R. L. Peterson

Ballistic Research Laboratories Aberdeen Proving Ground, Maryland

August 1972

DISTRIBUTED BY:



National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

**BRL MR 2213** 

8921220

BRL

AD

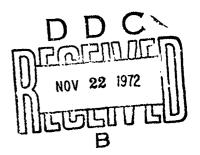
MEMORANDUM REPORT NO. 2213

# SHOCK TUBE TEST OF A 36" BLAST VALVE

by

R. L. Peterson

August 1972



Approved for public release; distribution unlimited.

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
US Department of Commerce
Springfield VA 22151

U.S. ARMY ABERDEEN RESEARCH AND DEVELOPMENT CENTER BALLISTIC RESEARCH LABORATORIES
ABERDEEN PROVING GROUND, MARYLAND

### UNCLASSIFIED

. Ale and a comparation of the comparation of the special contraction of the contraction

UNCLASSIFIED  Security Classification  (Security Classification of Stile, body of obstact and indexing 1 Originating activity (Corporate author)  U.S. Aberdeen Research & Development Center Ballistic Research Laboratories Aberdeen Proving Ground, Md. 21005  3 REPORT TITLE  SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  5. AUTHORIS (First name, middle initial, hast name)  R.L. Peterson  6. REPORT DATE August 1972  56. CONTRACT OR GRANT NO.  6. PROJECT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13 ABSTRACT  A 36" blast valve was positioned in a duct and subjected to blast in both the open an	Te. TOTAL NO. OF PAG  14  55. ORIGINATOR'S PEPE  BRL Memorandum  55. OTHER REPORT NO  mile report)	UNCLASSIFIED ROUP  75. NO. OF HEFS 0  DRY NUMBER(S) 1 Report No. 2213  (S) (Any other numbers that may
(Socurity classification of Strie, body of obstruct and industrial controlling activity (Corporate anthon)  U.S. Aberdeen Research & Development Center Ballistic Research Laboratories Aberdeen Proving Ground, Md. 21005  PREPORT TITLE  SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive darks)  B. AUTHOR(S) (First news, middle initial, feet memo)  R.L. Peterson  4. REPORT DATE  August 1972  54. CONTRACT OF GRANT NO.  65. AMCMS No. 5910.22.61252  66.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution of the supplementary notes  11 SUPPLEMENTARY NOTES	Te. TOTAL NO. OF PAG  20. 6  20. 7  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 7  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 7  20. 6  20. 7  2	UNCLASSIFIED ROUP  75. NO. OF HEFS 0  DRY NUMBER(S) 1 Report No. 2213  (S) (Any other numbers that may
(Security classification of twis, body of abstract and indexing I ORIGINATING ACTIVITY (Corporate author) U.S. Aberdeen Research & Development Center Ballistic Research Laboratories Aberdeen Proving Ground, Md. 21005  REPORT TITLE  SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  B. AUTHOR(S) (First name, middle initial, fact name)  R.L. Peterson  6. REPORT DATE  August 1972  6. CONTRACT OR GRANT NO.  6. PROJECT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in Supplementary Notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	Te. TOTAL NO. OF PAG  20. 6  20. 7  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 7  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 6  20. 7  20. 6  20. 7  2	UNCLASSIFIED ROUP  75. NO. OF HEFS 0  DRY NUMBER(S) 1 Report No. 2213  (S) (Any other numbers that may
Ballistic Research Laboratories Aberdeen Proving Ground, Md. 21005  REPORT TITLE  SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  8. AUTHORIS) (First name, middle initial, fact name)  R.L. Peterson  6. REPORT DATE  August 1972  86. CONTRACT OR GRANT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  b. other report no mis report)  nlimited.  12. sponsorine militate of P.O. Box 8	UNCLASSIFIED ROUP  75. NO. OF REFS  () DRY NUMBER(S)  1 Report No. 2213  (8) (Any other numbers that may
Aberdeen Proving Ground, Md. 21005  REPORT TITLE  SHOCK TUBE TEST OF A 36" BLAST VALVE  DESCRIPTIVE NOTES (Type of report and inclusive dates)  LAUTHOR(S) (First name, middle initial, hast name)  R.L. Peterson  REPORT DATE  August 1972  L. CONTRACT OF GRANT NO.  D. PROJECT NO.  C. AMCMS No. 5910.22.61252  d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	DRL Memorandum  BRL Memorandum  Br. other report no mile report)  nlimited.  12. sponsorine militate of P.O. Box 8	Th. No. OF NEFS  OPET NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  5. AUTHOR(S) (First name, middle initial, fast name)  R.L. Peterson  6. REPORT DATE August 1972  66. CONTRACT OR GRANT NO.  6. PROJECT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
SHOCK TUBE TEST OF A 36" BLAST VALVE  4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  5. AUTHOR(S) (First name, middle initial, fact name)  R.L. Peterson  6. REPORT DATE August 1972  66. CONTRACT OR GRANT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)  8. AUTHORIS) (First name, middle initial, feet name)  R.L. Peterson  6. REPORT DATE August 1972  6. CONTRACT OR GRANT NO.  6. PROJECT NO.  6. AMCMS No. 5910.22.61252  6.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in Supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
R.L. Peterson  R.L. Peterson  R.L. Peterson  R.L. Peterson  R. REPORT DATE  August 1972  B. CONTRACT OF GRANT NO.  B. PROJECT NO.  C. AMCMS No. 5910.22.61252  d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
R.L. Peterson  PREPORT DATE  August 1972  PROJECT NO.  C. AMCMS No. 5910.22.61252  d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
August 1972  B. CONTRACT OR GRANT NO.  B. PROJECT NO.  C. AMCMS No. 5910.22.61252  d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution to supplementary notes  11 SUPPLEMENTARY NOTES	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
August 1972  De. Contract of Grant No.  D. PROJECT NO.  C. AMCMS No. 5910.22.61252  d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in Supplementary Notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BRL Memorandum	OPRY NUMBER(8)  Report No. 2213  (8) (Any other numbers that may
b. PROJECT NO.  c. AMCMS No. 5910.22.61252 d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution in supplementary notes  11. Supplementary notes  13. ABSTRACT  A 36" blast valve was positioned in a duct	BRL Memorandum  BR. OTHER REPORT NO  BRID PROPERTY NO  BRID PROPER	Report No. 2213  (8) (Any other numbers that may
c. AMCMS No. 5910.22.61252 d.  10. DISTRIBUTION STATEMENT Approved for public release; distribution in Supplementary Notes  13. ABSTRACT A 36" blast valve was positioned in a duct	BRL Memorandum  D. OTHER REPORT NO  Bill report)  nlimited.  12. SPONSORING MILITA Office Chief of P.O. Box 8	Report No. 2213 (8) (Any other numbers that may
d.  10. DISTRIBUTION STATEMENT  Approved for public release; distribution to supplementary notes  11. Supplementary notes  12. ABSTRACT  A 36" blast valve was positioned in a duct	nlimited.  12. SPONSORING MILITA Office Chief of P.O. Box 8	(8) (Any other numbers that may
Approved for public release; distribution is supplementary notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	nlimited.  12. SPONSORING MILITA Office Chief of P.O. Box 8	IRY ACTIVITY
Approved for public release; distribution is supplementary notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	nlimited.  12. SPONSORING MILITA Office Chief of P.O. Box 8	
Approved for public release; distribution in supplementary notes  13 ABSTRACT  A 36" blast valve was positioned in a duct	nlimited.  12. SPONSORING MILITA Office Chief of P.O. Box 8	
A 36" blast valve was positioned in a duct	Office Chief of P.O. Box 8	
A 36" blast valve was positioned in a duct		Pugruccia
A 36" blast valve was positioned in a duct		ide, Md. 20755
A 36" blast valve was positioned in a duct	Trott dearge non	
	branching from closed position	an 8 ft diameter sh

UNCLASSIFIED

UNCLASSIFIED

Security Classification						s Breits!					
14.	~		KEY WORDS	KEY WORDS			. ELD	. ELMER, and			
					HOLE		ROLE		ROLE	WT	
Blast	Valve '	- `.	A STATE OF THE STA	` :		7 a	. (4)		30.70	وه حد	
Shock	Tube Test		•		1	1		, ,	1	,	
					]			'			
					] .		l		.,	-:	
							l				
							1	1			
							l	l			
						•	l	1	i	,	
						,	ļ	,			
							1	ł			
							1	ļ		'	
			•								
									1		
									ł		
					ļ						
				J							
					ł		-	ı	ĺ		
					1		l	i	l		
		•			i	1	-		- 1		
				ĺ			1	-	ĺ		
				i			Ì	1	- 1	Ī	
					j	ļ	- 1	- 1	ļ	1	
					- 1		1		ļ		
				İ	- 1	į		1			
				ļ	- 1	1	[		ŀ	•	
					- }	}	ĺ			ı	
						į		- 1			
				- 1	- 1		1	i	1	, i	
							- 1	1		1	
										Į	
					ì	í	1			İ	
					- 1	1	1		1	ì	
				l	- 1				1	9	
						İ			Ì	ĺ	
					ļ					1//	
						1			Ì	Ì	
			•							1	
			-2-	l	ļ		1	1	i	•	
				ł	1	Ĩ		ş			

UNCLASSIFIED

The state of the s

Destroy this report when it is no longer needed. Do not return it to the originator.

Secondary distribution of this report by originating or sponsoring activity is prohibited.

Additional copies or this report wav be purchased from the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22151

KTIS	White, Section	
B.'C	Bui. Section	
urani.0"".ced		
MOTADIALISM		
BY Distribution/		DE <b>S</b>
Dist. Ai	AIL. ant/or SPal	SIÁL

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

## BALLISTIC RESEARCH LABORATORIES

## MEMORANDUM REPORT NO. 2213

AUGUST 1972

SHOCK TUBE TEST OF A 36" BLAST VALVE

R.L. Peterson

Terminal Ballistics Laboratory

Approved for public release; distribution unlimited.

Work was supported by Corps of Engineers on AMCMS No. 5910.22.61252

ABERDEEN PROVING GROUND, MARYLAND

### I. INTRODUCTION

At the request of Corps of Engineers, personnel of Ballistics Research Laboratories subjected a blast valve to a series of six shock tube generated tests, during the period 22 February through 7 March 1972.

The test subjected valve is a 36 inch butterfly-type designed for installation in air conditioning ducting of hardened underground sites to protect personnel in the event of an nuclear explosion.

#### II. OBJECTIVES

The test objectives were to determine the structural integrity of the valve body under shock loadings and to dynamically test the automatic valve closure trigger mechanism. Testing parameters as set forth by Corps of Engineers were to be shock levels of 2, 3, 10 and 25 psi overpressure with the valve tested in both open and closed mode. During a planning meeting held with representatives of Corps of Engineers, Aberthau Construction Co. and BRL, it was agreed that BRL would supply the blast environment required to meet Corps of Engineers testing criteria, but would not evaluate the valve's performance.

### III. PROCEDURE AND RESULTS

Testing was accomplished utilizing the 8' diameter shock tube at the BRL Dual Shock Tube Facility. The valve was installed with standard flange mounting in a 36" diameter branch duct. Four data channels of shock wave histories were obtained using CEC type 4-316 unbonded strain pressure transducers and recorded on a CEC 12" oscillograph. Angle of valve vane rotation was recorded through use of a rotary potentiometer affixed to the vane shaft. Following each test the valve was operated manually to determine its continued ability to function.

The location of the data acquisition points, valve placement and test layout are shown in Figure !. Figures 2 through 7 show the pressure time records acquired during the shot condition tested. Table 1 lists pertinent shock data.

Shot No.	Station P-2 P <sub>S</sub>	Valve Position at shock arrival	Temp.	P <sub>amb</sub>	
8-72-1	28.45*	Closed	1.0		
8-72-2	2.10	Open	10.3	30.09	
8-72-3	3.29	Open	12.46	29.95	
8-72-4	26.74*	Closed	14.98	29.96	
8-72-5	2.22	Open	2.90	29.71	
8-72~6	11.49	Open	4.76	30.23	

\*Shock Keflection

er de la company de la company de la company de la company de la company de la company de la company de la comp

P<sub>S</sub>: Shock Overpressure

Valve Position:  $5^{\circ}$  = open  $83^{\circ}45^{\circ}$  = closed

P<sub>amb</sub>: in. mercury

The valve endured the tests with no apparent damage.

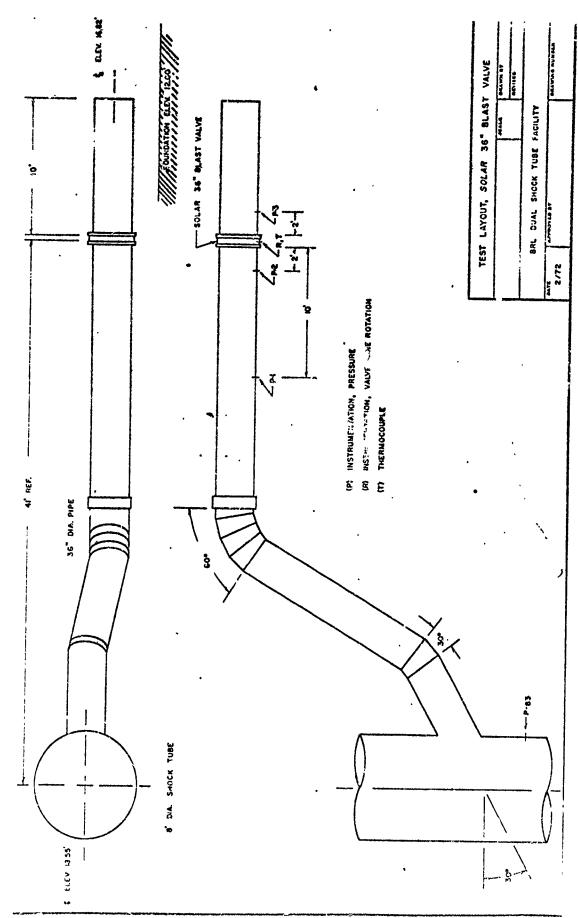


Figure 1. Test Layout

A STATE OF THE PROPERTY OF THE

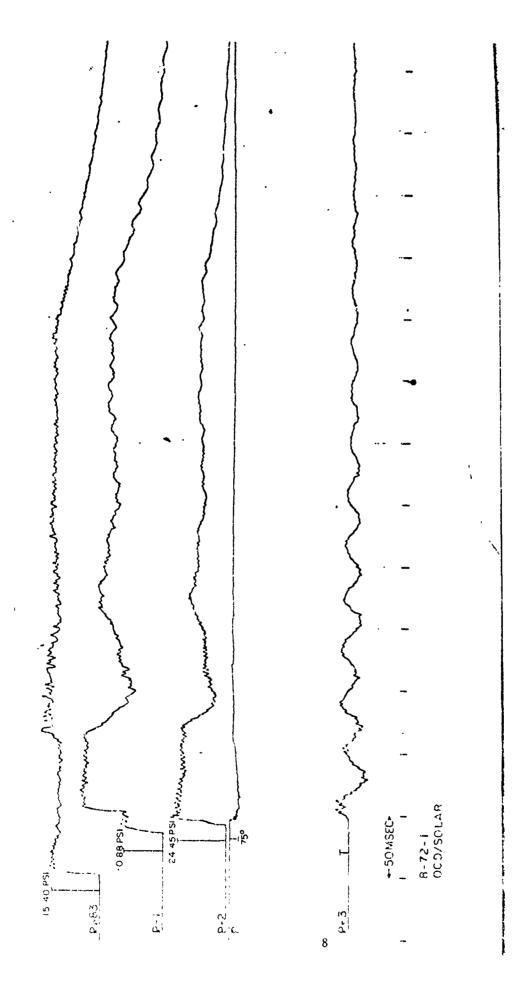
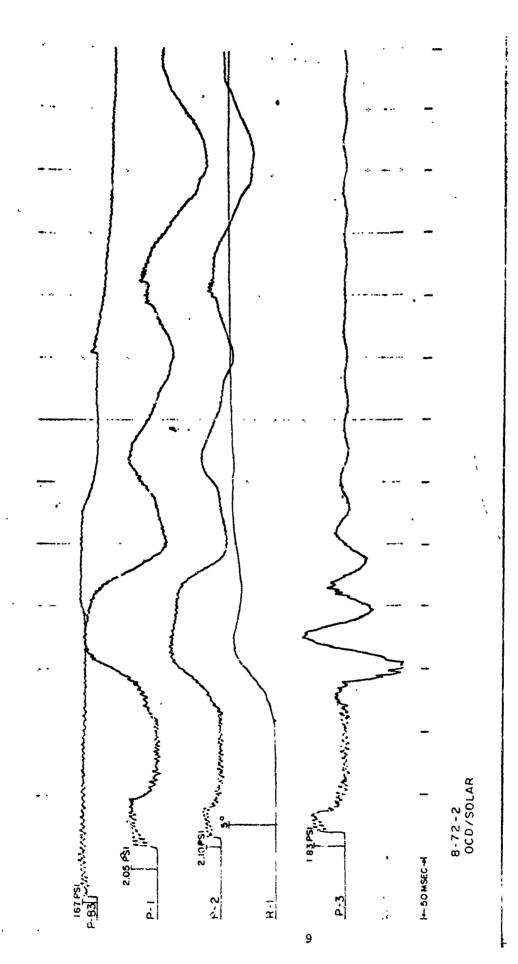


Figure 2. Records



THE PARTY OF THE P

Figure 3. Records

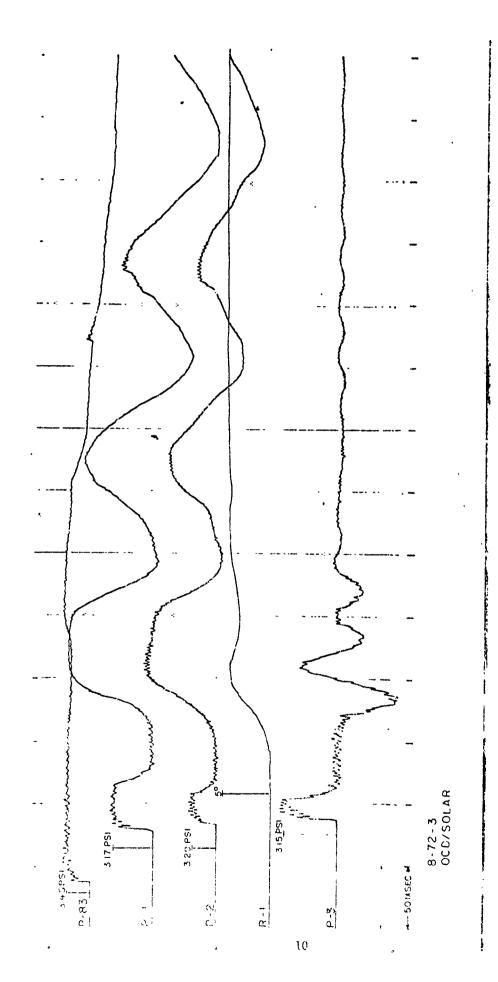


Figure 4. Records

A Comment of the School of the

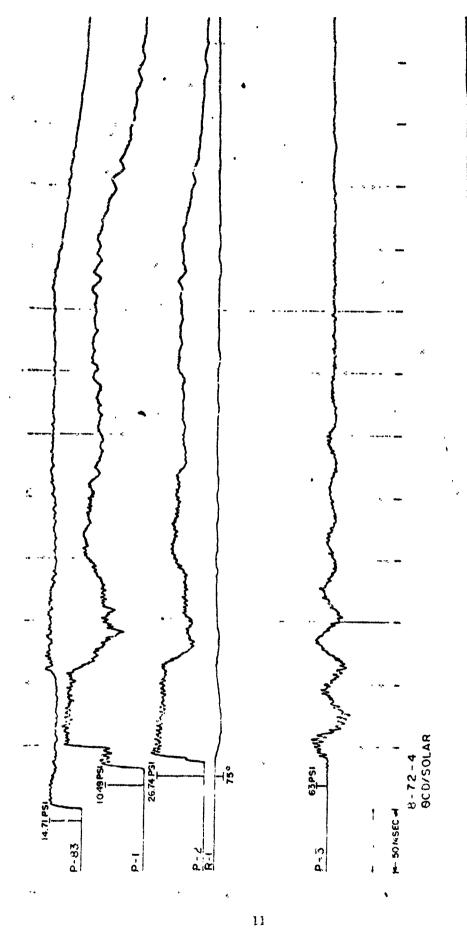
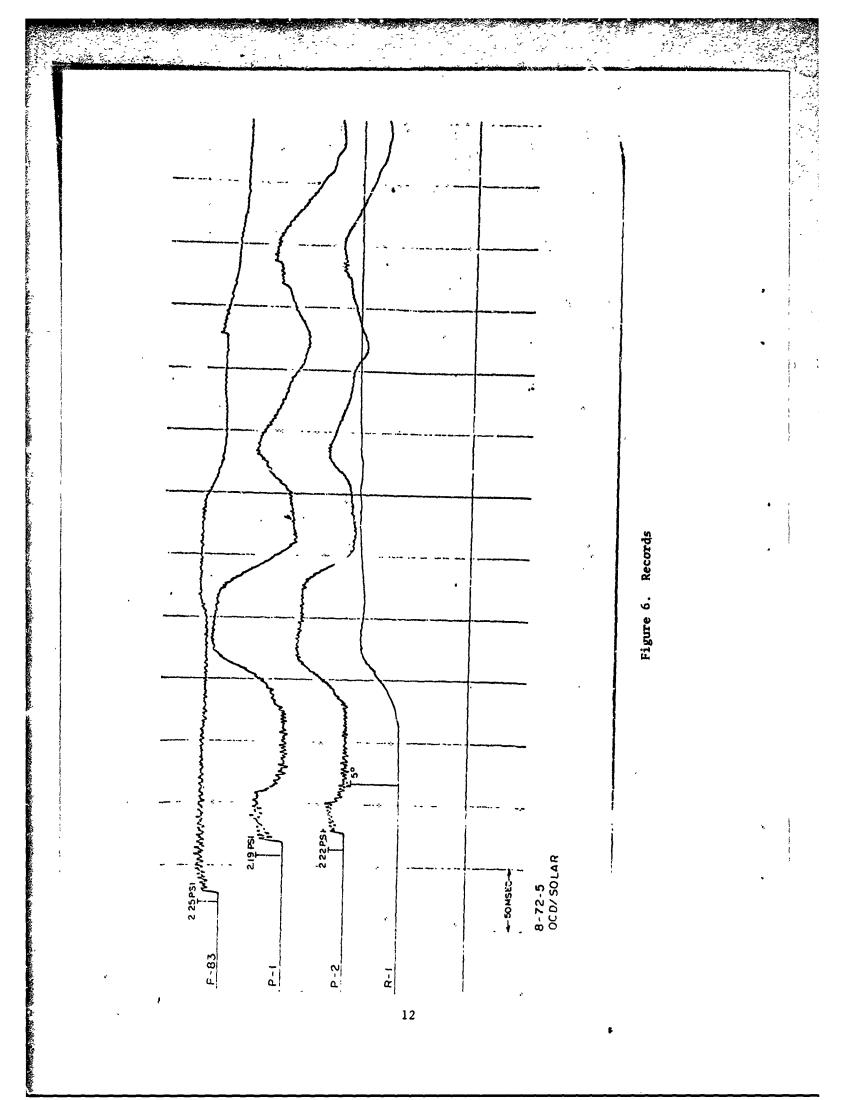


Figure 5. Records



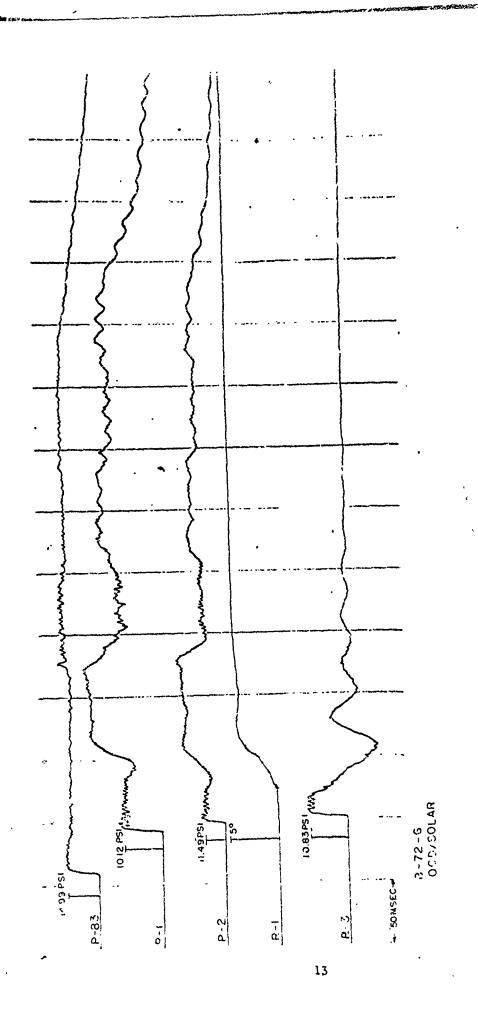


Figure 7. Records